

## ABSTRACT OF THE DISCLOSURE

A multi-functional opto-electronic system is mainly applied to the real-time metrologies of biomedical or biochemical reactions as well as the in-situ manufacturing measurements of biochips. The configuration of this system is built up by integration of at least four different near-field optical metrological principles , which share a part of common optical path design and allow to turn on several functions such as ellipsometer, Laser Doppler vibrometer or interferometer (LDV/I), surface plasmon resonance (SPR) for amplitude and phase detection, phase shifting interference microscope, photon tunneling microscope, optical coherence tomography (OCT) and imaging microscope by switching few components in the system. With the creation of a novel opto-mechanical design and its associated signal processing methodologies, both the signal detection of the biomedical reactions and biomedical imaging concerned for the future trend in the modern biomedical sciences are achieved with high resolutions.